

Dynamic Patient Events and Impact on Nursing Workload

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Abstract

Research has shown that an appropriate allocation of staff favorably impacts patient outcomes, patient safety, financial outcomes, and staff satisfaction. Staffing methodology involves matching the appropriate number, skill, and mix of registered nurses and unlicensed personnel to the specific care needs on a unit. The challenge of adequately staffing is amplified by higher patient acuities and dynamic patient events, defined as rapid and unanticipated changes in patients' clinical status or nursing care needs that result in sudden shifts in nursing workload and the need to carry out rapid staffing adjustments. The purpose of this study is to examine how dynamic patient events, such as codes, emergency response needs, bedside procedures, monitored patient travel time and requirements for patient safety attendants, impact nurse staffing levels. Research will be conducted on two medical-surgical units at the OSU Wexner Medical Center and OSU East. Using a cross-sectional approach, specific dynamic patient events from these two units will be entered into the Dynamic Event Workload Capture module of the Cerner Clairvia™ system, the current staff decision support technology utilized at OSUHS. This module immediately recalculates the staffing requirements based on patient acuities and other workload demands as unanticipated and dynamic events occur. Descriptive analysis will be used to determine the mean number of dynamic patient events and to categorize these events by type and time involved. Correlational analysis will evaluate the relationship between unit acuity and number and duration of dynamic patient events, and acuity target staffing levels and dynamic patient events. We hope this project will offer insight into potential solutions for efficiently staffing for these events.

Chapter I

Introduction

Determining how to best staff a hospital unit has been a challenging task for decades. Research has shown that appropriate staffing leads to improved patient outcomes, patient safety, staff satisfaction and cost effectiveness (Kane, Shamliyan, Mueller, Duval & Wilt, 2007). Although the benefits of optimal staffing are known, nurse managers lack the tools to reliably and practically measure nursing workload (Hoi, Ismail, Ong & Kang, 2010). Once solely based on volume-driven ratios, the number of nurses scheduled for each shift was dependent upon the number of patients occupying the unit at the midnight census. This approach proved to be imprecise and over time more factors such as patient acuity, admissions, discharges and transfers were taken into account as well (Mark, 2011; Unruh & Fottler, 2006). Another aspect of the staffing challenge involves the occurrence of *dynamic patient events*, which are rapid and unanticipated changes in patients' clinical status or nursing care needs that result in very sudden shifts in nursing workload and the need to carry out rapid staffing adjustments.

Today, with technological advances, we are able to measure these components with greater accuracy and provide a more expansive picture of the factors contributing to nursing workload. By assessing the impact of dynamic patient events, such as codes, ERTs, bedside procedures, sitter cases and patient travel requiring a nurse, we can more effectively evaluate nursing workload and develop staffing solutions. This project seeks to examine the impact of these dynamic patient events, a topic that has not yet been examined by research studies at this time. The specific aim of this study is to:

- Determine the impact of *dynamic patient events* on nursing workload by using nursing staffing decisions support technology.

Chapter II

Review of Literature

Nurses are the largest component of hospital staff and the cost of their care makes up the single biggest part of a hospital's budget. In addition to financial reasons, the twenty-four hour nature of nursing and the direct impact nurses have on patients' quality of care makes accurate prediction of nurse staffing requirements vitally important (Beswick, Hill & Anderson, 2010). Staffing measurements take a multitude of factors into consideration such as patient volume, patient acuity and number of admissions, discharges and transfers that occur in a day. The main component of staffing needs, nursing workload, is the least quantifiable. Nursing workload is often conceptualized "in terms of nursing intensity, patient dependency, clinical acuity or the severity of patient illness, as well as the complexity of care required and the time taken to administer patient care" (Morris, MacNeela, Scott, Treacy & Hyde, 2007 p.464). The difficulty defining nursing workload contributes to the difficulty determining a standardized measurement system.

A nurse's workload consists of not only direct patient care factors, such as medication administration, but also indirect and non-patient care activities. Indirect patient care involves tasks including coordination of transport or planning discharges. Non-patient care activities involve unit or organizational obligations like staff meetings (Morris, MacNeela, Scott, Treacy & Hyde, 2007; Harper, 2012). A multitude of instruments have been developed that measure the time required for each of these types of activities in order to determine appropriate staffing levels (Dunn, Norby, Cournoyer, Hudec, O'Donnell & Snyder, 1995). However, estimated times cannot account for the differences between patients and situations that cause activities to take up more or less of a nurse's time. For example, a certain amount

of time may be budgeted for a nurse to take a patient to MRI. The actual time spent could vary enormously if the patient became confused or combative en route or if MRI was overbooked. In addition, there is little research comparing instruments or pointing towards a standardized system of workload measurement.

The midnight unit census is typically used as the point at which patient volume and nursing workload is measured to determine the daily nurse staffing levels. Research has shown, however, that this can result in inaccuracies and underestimation of the total number of patients nurses care for on a unit in a twenty-four hour period. Beswick, Hill and Anderson (2010) found a significant difference between midnight census patient counts and intra-day census when looking at the total number of patients cared for on a unit in twenty-four hours. The midnight census method does not take into account the patient movement that occurs with admissions, discharges and transfers throughout the day (Beswick, Hill & Anderson, 2010; Baernholdt, Cox & Scully, 2010).

To take these admissions, discharges and transfers into account the Unit Activity Index (UAI) measurement was developed. This system examines the total number of patients treated within twenty-four hours on a nursing unit divided by the number of admissions, discharges and transfers (ADTs) within that twenty-four hour time frame (Baernholdt, Cox & Scully, 2010). Though an RN may never care for more than four or five patients at a given time, the total number of patients during a shift could be much higher. Nurses perceive this increase in total patients cared for as an increase in workload (Norrish, & Rundall, 2001). Using the UAI method allows for clearer evaluation of nursing workload and helps ensure more accurate staffing measures.

One factor that neither the UAI nor ADT measurements account for is the effect of dynamic patient events. Dynamic patient events include codes, emergency response teams, sitter cases, bedside procedures and patient travel requiring RN monitoring. These types of events require the nurse or PCA to take time away from the rest of their work to spend one-on-one time with an individual patient. This shift in focus and disruption of normal workflow patterns is not factored into the daily staffing requirements but can have a significant impact on workload.

Work interruptions, such as dynamic patient events, can have a significant impact on workload. With busy schedules, nurses cannot afford to spend time waiting to complete a task, instead they often switch to another activity to avoid standing idle (Potter et al., 2005). Nurses must switch their focus from one task to another, recollecting their thoughts and reconsidering their original purpose and destination numerous times during each shift. Due to this shifting focus, “work interruptions not only add to nurses’ workload, they have a serious impact on their mental load”(Myny et al., 2012 p.432). This growing mental burden can have detrimental effects on quality of patient care.

Another side effect of work interruptions and increased nursing workload is the risk of adverse events and missed nursing care. When a nurse or PCA is caught up with in one patient’s room, another provider might help out with their other patient assignments. This shift from one caregiver to another could result in errors since the new caregiver is not as familiar with the patient. Missed nursing care, or “any aspect of required patient care that is omitted (either in part or whole) or significantly delayed,” is another possible outcome (Kalisch, Landstrom, & Hinshaw 2009 p.1510). The most frequent cause of missed care was reported by RNs and UAPs to be labor resources; more specifically: inadequate staff, urgent

patient situations, and unexpected rise in patient volume and acuity (Kalisch, Gosselin, & Seung Hee 2012).

Hospital activity and patient acuity have been rising in the past few decades. Unruh & Fottler (2006) found significant declines in patient's average length of stay, increases in patient turnover and declines in adjusted RN staffing ratios during the years 1996-2001. Higher acuity patients that were once cared for solely in ICUs are now often placed on medical-surgical units. For this reason it is vital to have appropriate levels of staff. Research has shown that nurse staffing has been linked to patient complications and deaths in hospitals. Low staffing has also been associated with higher rates of patient falls and lower quality of care (Hoi, Ismail, Ong & Kang, 2010). Another study discovered a "statistically and clinically significant association between RN staffing and adjusted odds ratio of hospital-related mortality, failure to rescue and other patient outcomes" (Kane, Shamliyan, Mueller, Duval & Wilt, 2007 p.1202). These findings underscore the need for proper evaluation of staffing requirements.

"In response to the scarcity of solid data and the absence of a universally standardized acuity tool, some states have incorporated mandates to address the problem associated with patient safety and nurse staffing"(Beswick, Hill & Anderson, 2010 p.594). California became the first state to require specific nurse to patient ratios in all California hospitals in 2004. Despite improved staffing ratios, studies found no significant increases in measurements of nursing quality. It was, however, noted that patient acuity increased during this time period, indicating the lack of change in nursing quality could be a result of more complex patients (Donaldson & Shapiro, 2010).

Since alterations in patient volume cannot usually be predicted far enough in advance, hospital units must often make staffing adjustments by utilizing short-term, high-cost methods. When patient volume increases, employees might be requested or mandated to work overtime or centralized float pool nurses must be scheduled. If the unit census falls below the budgeted level, nurses could be requested or mandated to take the day off without pay (Norrish & Rundall, 2001). Inappropriate staffing levels can prove costly to both the organization and its employees.

Today, the use of technology in the healthcare field is rapidly growing. The advent of computer programs with the ability to rapidly analyze clinical data allows for vastly improved measurement of nursing workload. One such system of predicting nurse staffing requirements is the Cerner Clairvia™ System. This tool extracts “data from the EHR [electronic health record] (e.g. routine documentation of patient observations, interventions, and lab values) and translates it into a Likert rating (1-5) for each outcome (e.g. respiratory status). The outcomes are summed and generate a total score that is aligned to an acuity level”(Harper, 2012 p. 263). With this technology, we are better able to account for the multitude of factors influencing nursing workload, including dynamic patient events.

The aim of this project is to utilize the Cerner Clairvia™ system to assess the impact of dynamic patient events on nurse staffing levels and nursing workload.

Chapter III

Methods

Design.

A cross-sectional approach was utilized.

Setting.

This project took place at the Ohio State University Hospital System on two medical-surgical inpatient units. One unit, 11 East Rhodes, cares for patients with infectious and pulmonary diseases. The other, Tower 5 at OSU East, specializes in the care of patients with cardiac disease.

Sample.

A total of 21 shifts were observed on the two units over the course of five weeks.

Table 1 illustrates the percentage (and number) of day, evening and night shifts observed on each unit.

Table 1.

	Day Shifts (%)	Evening Shifts(%)	Night Shifts(%)
11 East Rhodes (Total shifts =10)	50% (5)	20% (2)	30% (3)
Tower 5 (Total shifts =11)	64% (7)	18% (2)	18% (2)

Data Collection Procedure.

During the final hour of each observed shift, the data collector spoke with the charge nurse to determine whether any dynamic patient events, such as codes, ERTs, bedside

procedures, patient travel or sitter cases covered by unit staff, occurred during that eight-hour period. The nurse responsible for the patient was then approached to obtain the time the event took place. The patient's name, MRN number, type and length of the event were recorded in a binder stored on the unit.

At these hospitals, the Cerner Clairvia™ system is used to identify the appropriate level of nursing care based on patient needs. This system has an array of modules that help to predict optimal staffing requirements. For this project, the Dynamic Event Workload Capture module and the Acuity module were the focus. The Dynamic Event Workload Capture module tracks dynamic patient events and resulting increase in workload for the health care provider during the shift. The Acuity module measures the severity of a patient's illness so appropriate resources are available to promote patient wellness.

Following data collection, the results were entered into Dynamic Event Workload Capture module of the Cerner Clairvia™ System. This module will recalculate the staffing requirements based on patient acuities and other workload demands when dynamic event information is entered into the program. Measures collected include overall unit target acuity (the calculated staffing needs based on the unit patient acuity, census, and ADT), actual scheduled staff for the shift (the staff assigned during that time period), variance in staffing (the target acuity minus the actual acuity), percent utilization of staff (target hours divided by scheduled hours expressed as percentage), and average unit acuity, and dynamic patient events.

Data Analysis.

Descriptive analysis was used to evaluate the data. The mean number of dynamic patient events per shift, per unit and per skill level was calculated. Dynamic patient events

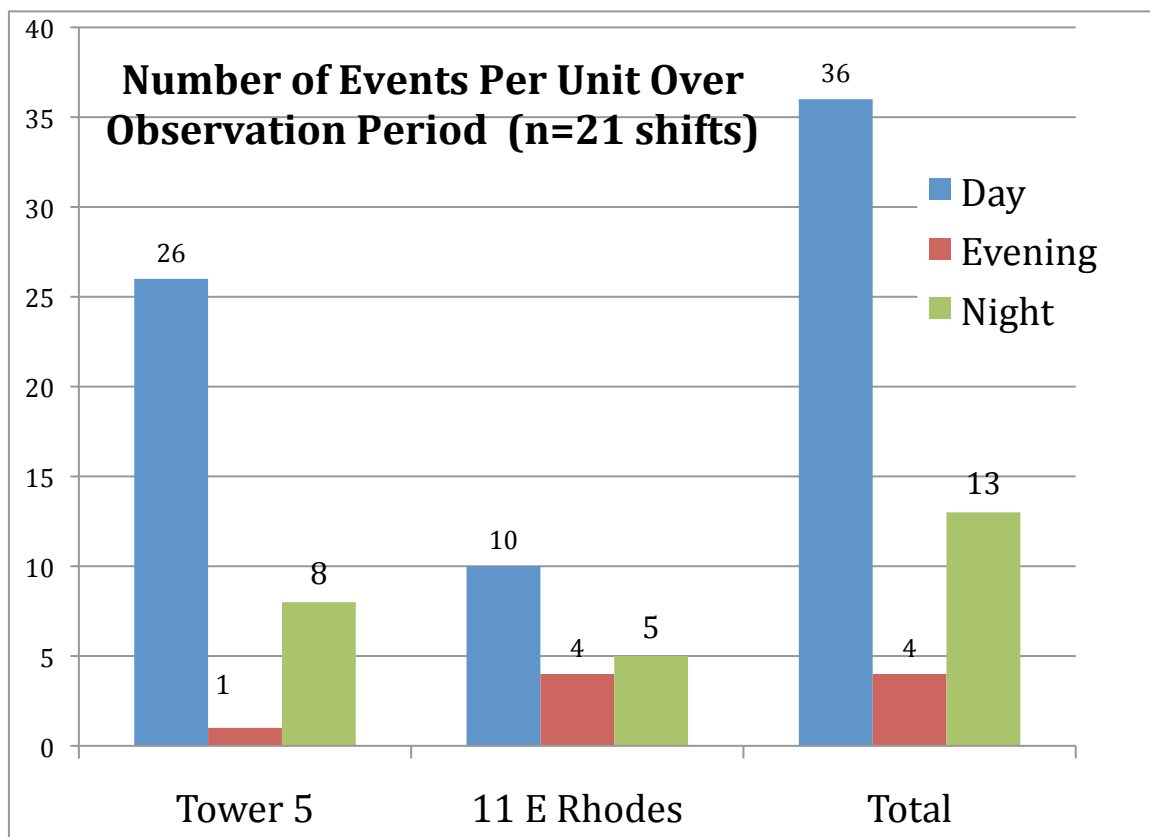
were categorized by the time of day, length, and type (e.g. sitter case, travel). Using correlational analysis, the relationship between staffing levels and the number and length of time of dynamic patient events is examined.

Chapter IV

Results

A total of 53 events were entered into the Cerner Clairvia™ System Data Capture Module. During the time of observation, 34 events occurred on Tower 5 at OSU East and 19 occurred on 11 East Rhodes at OSUMC. Fifty percent of observations on Tower 5 occurred during the day of which there were 26 events. Thirty percent of the observations occurred at night, with a total of 8 events observed. On 11 East Rhodes, 64% of the observations occurred during day shifts, with 10 events observed. Eighteen percent of the observations took place on evening shift during which 4 events were recorded. Night shifts were also observed for 18% and 5 events were recorded. A total of 36 events occurred during day shifts. Evening shifts experienced 4 events and night shifts experienced 13. Figure 1 illustrates these findings.

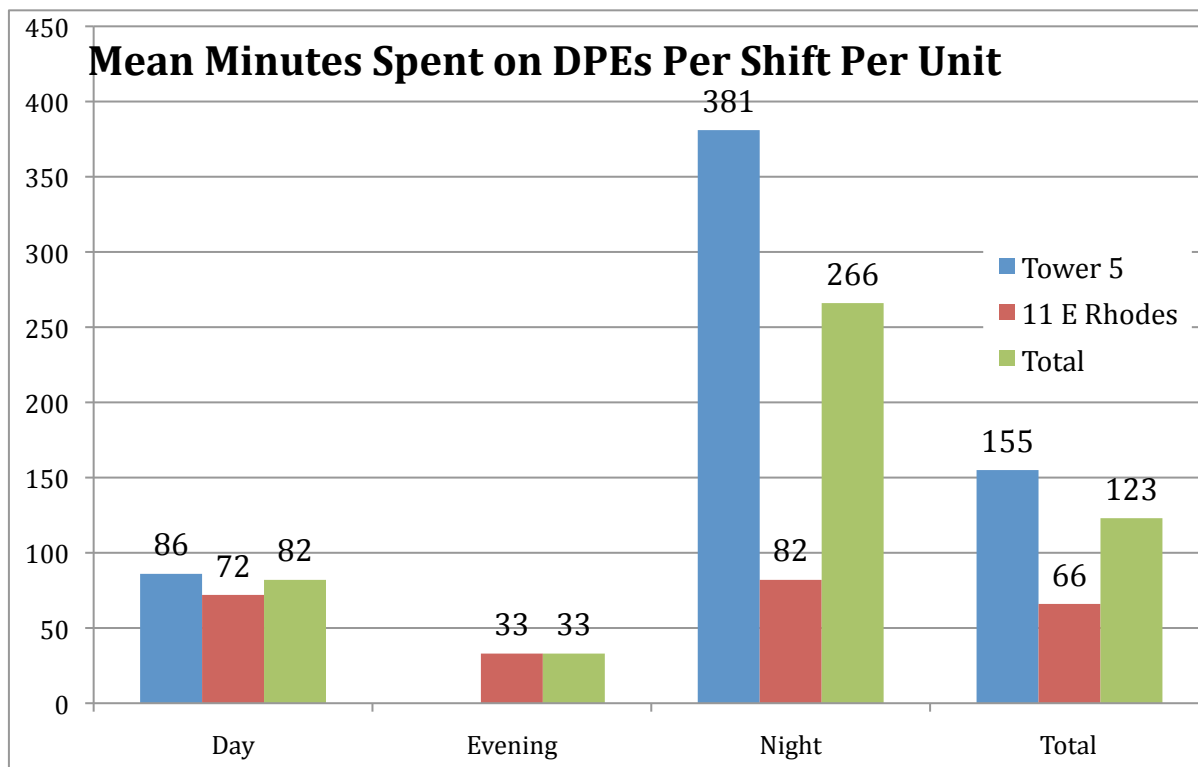
Figure 1.



The dynamic patient events were also broken down by type. Three different categories of event were observed on the units: travel requiring RN monitoring, sitter cases covered by unit staff, and ERTs. Events involving patient travel took place the most often (n=36), followed by sitter cases (n=15) and ERTs (n=3). On Tower 5, there were 21 instances of patients traveling with an RN, 12 sitter cases and 1 ERT. On 11 East Rhodes, 15 events involved traveling with an RN/PCA, 2 sitter cases and 2 ERTs.

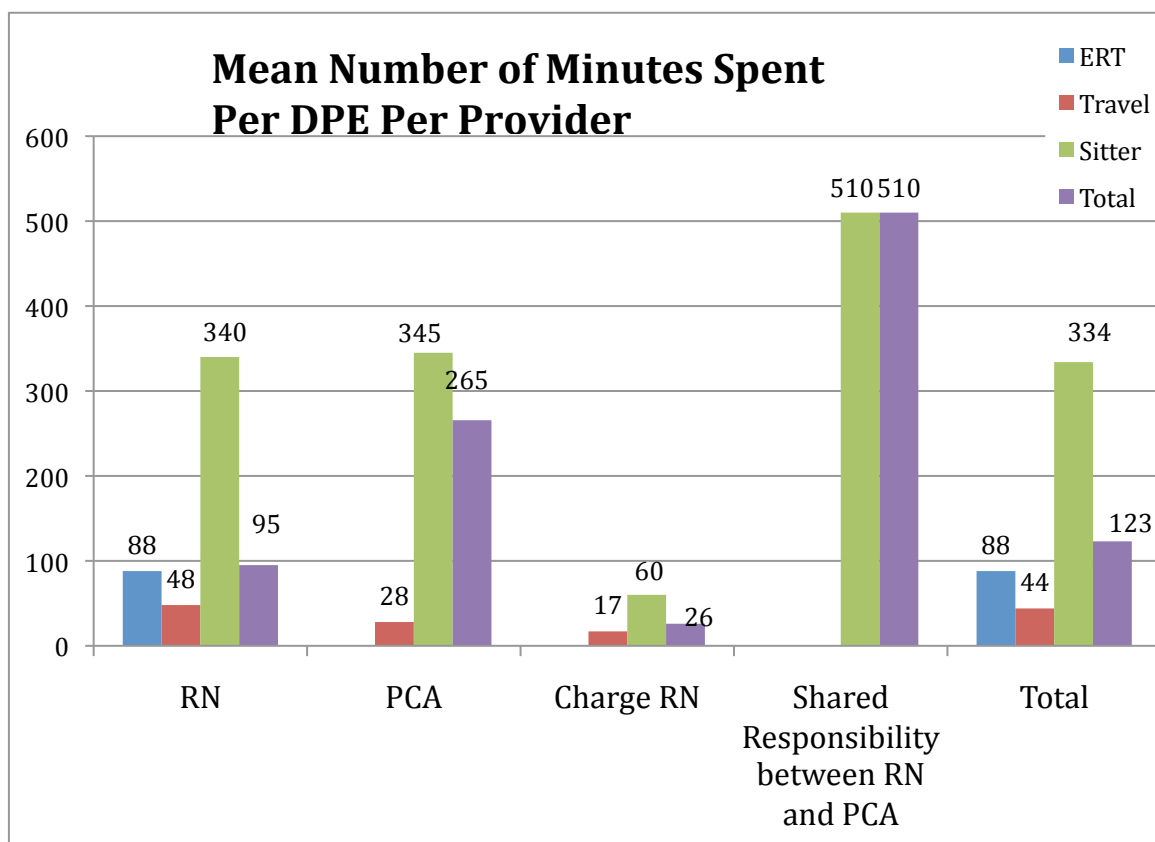
The mean time of a dynamic patient event was 123 minutes (n=53). On Tower 5 alone, the mean time was 155 minutes. (n=34). On 11 East Rhodes, the mean dynamic event time was lower, only 66 minutes (n=19). On Tower 5, sitter cases took up the most amount of time with a mean length of 365 minutes (n=12). For patient travel on Tower 5, the mean time was 41 minutes (n=21). The mean times for sitter cases and patient travel on 11 East Rhodes were 150 minutes (n=2) and 47 minutes (n=15), respectively. Figure 2 displays these findings.

Figure 2.



RNs managed dynamic events on the unit most frequently; they were involved in 41 of the 53 events that took place. PCAs with were involved in a total of 8 events and charge RNs with 4. RNs spent an average time of 48 minutes traveling with patients (n=31), 340 minutes sitting (n=6), and 88 minutes in ERTs (n=3). PCAs averaged 345 minutes sitting with patients (n=6) and 28 minutes traveling (n=3). Charge nurses, spent a mean time of 17 minutes traveling with patients (n=3). Figure 3 illustrates these findings.

Figure 3.



The time and duration of these events were entered into the Clairvia™ system. Reports were generated pre- and post- event entry to allow for comparison of staffing requirements. Staffing needs rose as the number and duration of dynamic patient events increased. On Tower 5, the actual staffing requirements with dynamic patient events were visibly below the

current staffing levels. On 11 East Rhodes, the entry of dynamic patient events resulted in much smaller changes to staffing needs. Figures 4 and 5 illustrate these findings.

Figure 4.

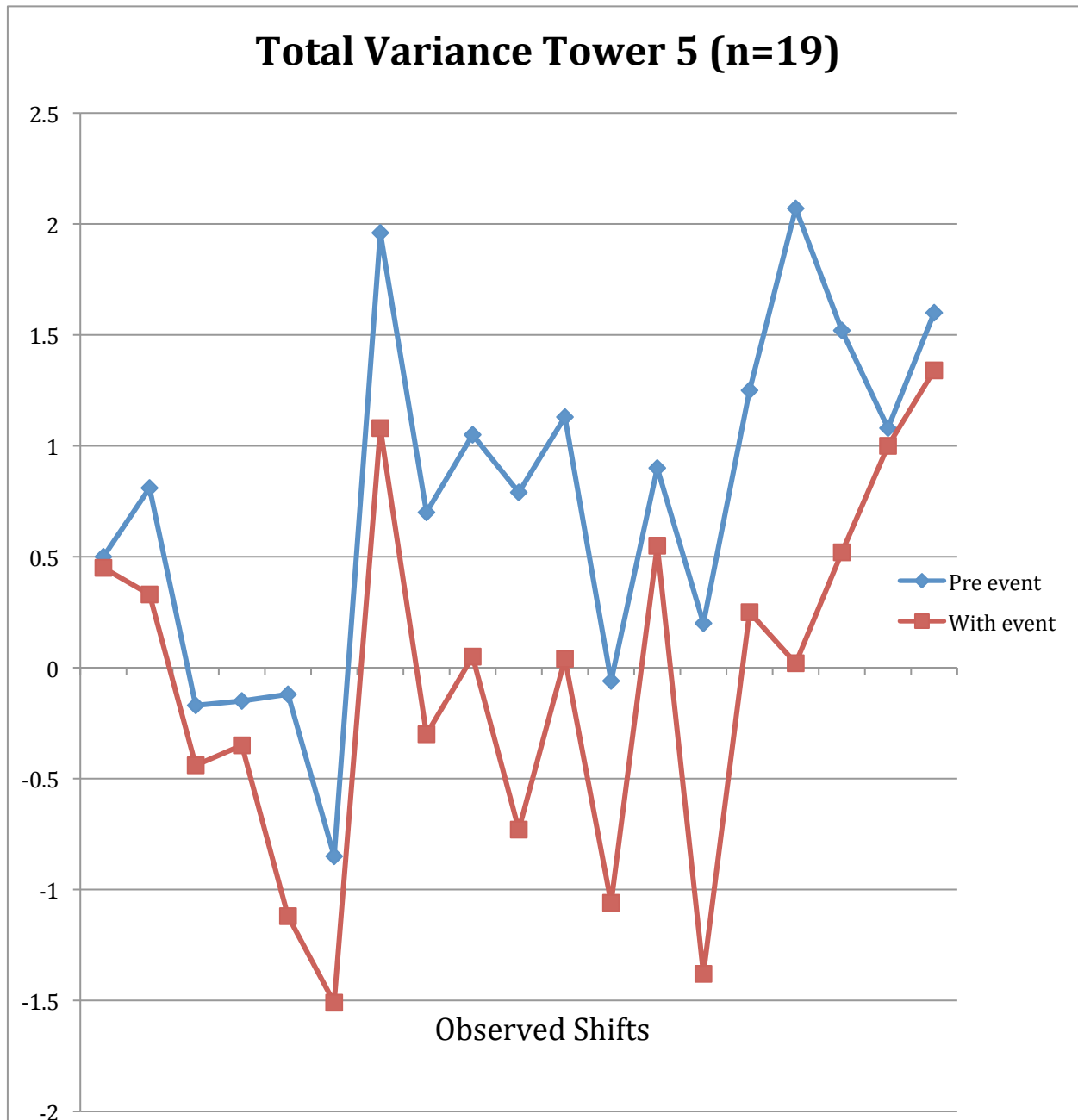
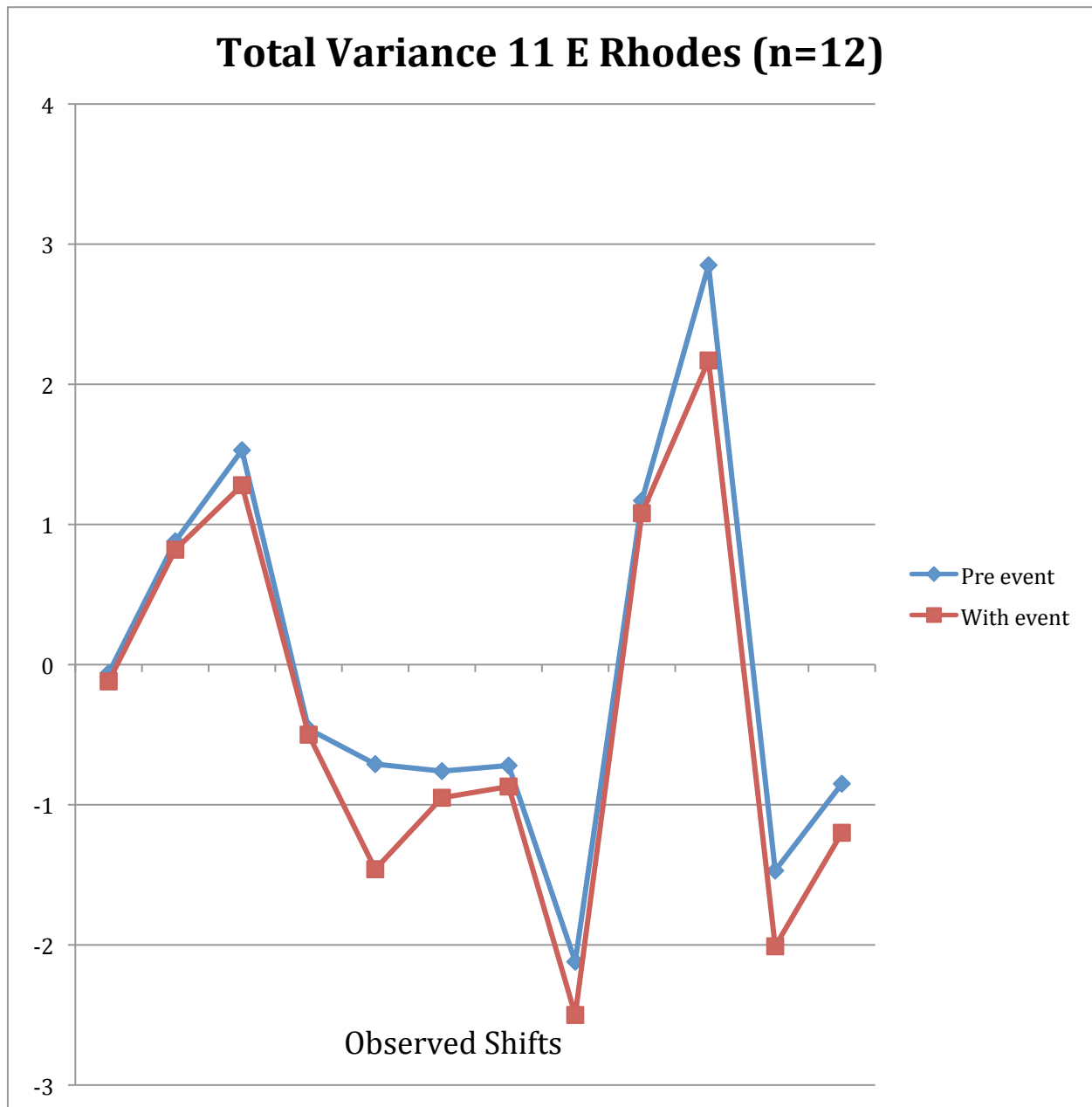


Figure 5.

Another aspect of staffing measured by the data capture module was the utility level, or productivity, of the staff. As staffing demands increased following dynamic patient event entry, so too did the staff productivity levels. The utility levels show an inverse relationship with the total variance. Similar to the variance charts, larger differences between pre- and

post- event entry data are visible on Tower 5 than on 11 E Rhodes. These findings are illustrated in figures 6 and 7.

Figure 6.

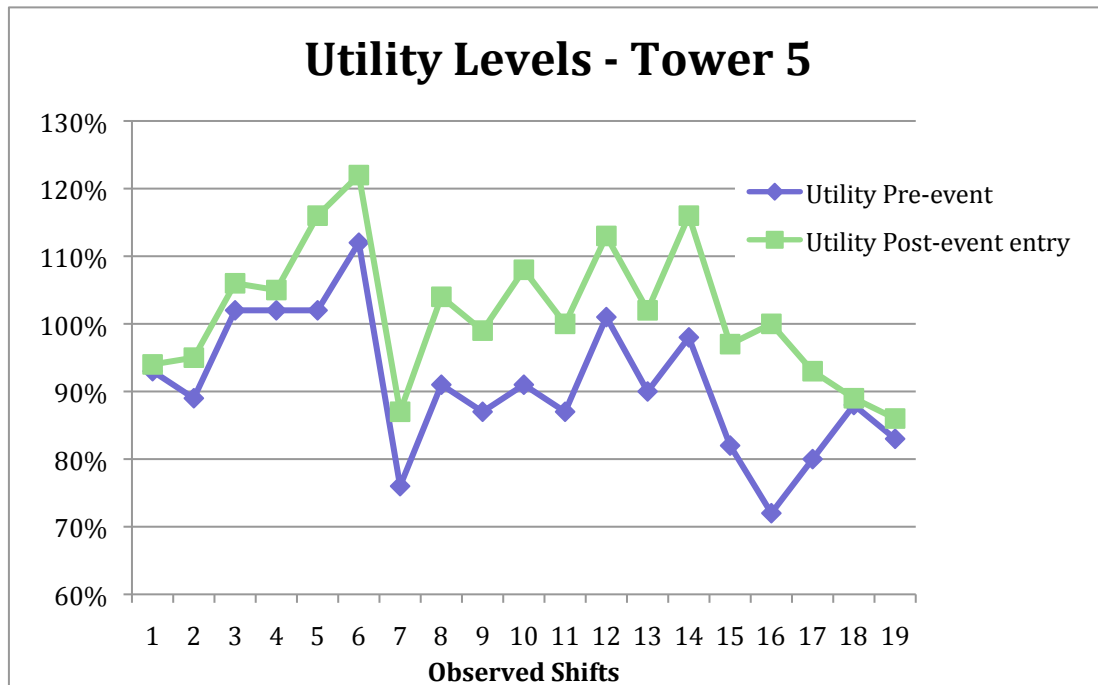
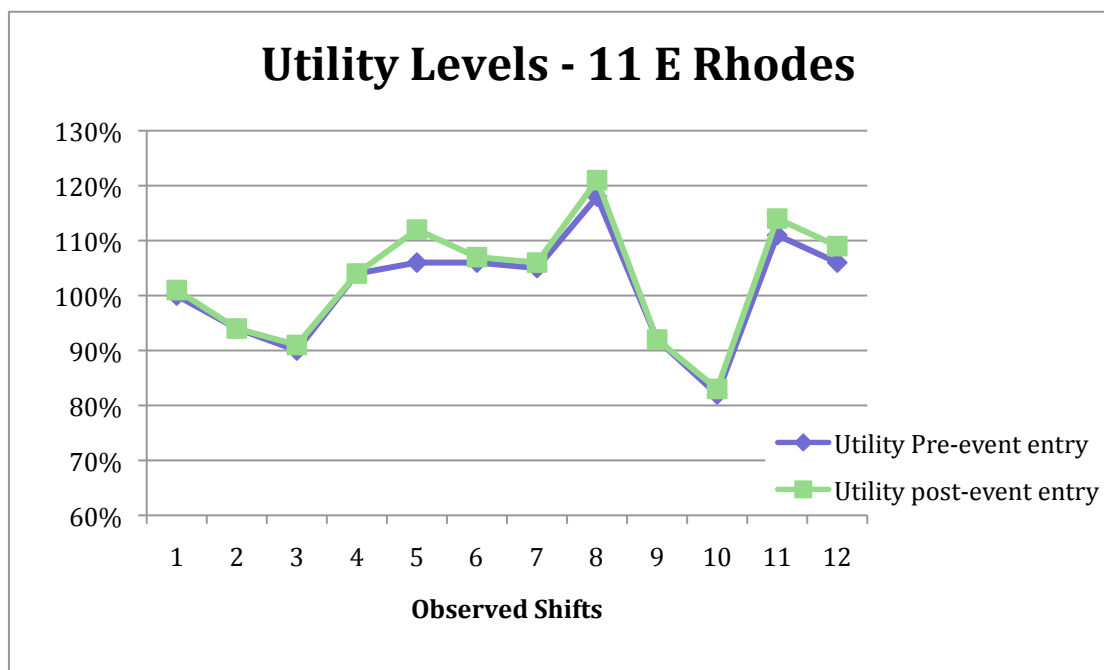


Figure 7.



Chapter V

Discussion

The goal of this project was to determine the impact of dynamic patient events on nursing workload through the use of nurse staffing decision support technology. Our findings indicate that increased number and/or duration of dynamic patient events correlate with positive increases in target staffing. With a rise in dynamic patient events, a corresponding rise in staffing needs is visible. Similarly, the staff utility levels rise as dynamic patient events occur and health care providers must adapt to the shift in workload. When staff is shown to be working at 100% utility, they are functioning at full capacity. As staffing utility drops below the 100% marker, units are losing money because they are underutilizing staff.

As seen in Figures 6 and 7, there are multiple shifts when staffing utility spikes above the 100% level. On these occasions, staff must compensate for increased workload by performing at a higher level since there is no other staff available to make up the difference. While overstaffing results in additional costs to unit budgets, there are also consequences when staff is faced with heavy workloads. The risk for adverse events and missed care increases as staff becomes busier. Baernholdt, Cox & Scully (2010) found that RNs with lighter workloads reported less emotional exhaustion and higher levels of job satisfaction than those with heavy workloads.

This project also provides a clearer picture of the nature of dynamic patient events. The most frequent event type was monitored patient travel, involving thirty-six of the fifty-three events. Though travel occurred most often, sitter cases covered by unit staff were the most time consuming, averaging 365 minutes. These results provide valuable knowledge regarding dynamic patient events' interruption of workflow. Frequent interruptions to staff's

focus and rhythm of work can prove detrimental to quality of patient care. As a nurses' attention is drawn from one task to another, studies have shown that their cognitive load increases and can result in omissions of care (Baernholdt, Cox, & Scully, 2010).

Nurses were the primary health care providers involved in dynamic patient events, managing 41 of the 53 events. They spent an average of forty-seven minutes during each monitored patient travel and 340 minutes sitting with patients. When these events took place, nurses had to turn their attention from the rest of their assignment to focus on one patient for the duration of the event. The significant amount of time nurses were required to sit with patients represents an underutilization of their knowledge and skills. In addition, it costs the unit much more to pay a nurse's salary than that of a PCA.

There were significant differences between the results from 11 East Rhodes and Tower 5. While data shows wide discrepancies between pre- and post- event entry staffing on Tower 5, 11 East Rhodes' values show little variation. 11 East Rhodes is a unit at the main medical center and has more resources (e.g. float pool staff, sitters) available to accommodate any unanticipated increase in staffing needs. Tower 5, on the other hand, lacks these resources and must utilize their own staff members when dynamic patient events occur. This can be seen in the large variation in the mean time of dynamic patient events on each of the two units. 11 East Rhodes has an average of 66 minutes per dynamic patient event. Tower 5's mean time, however, is more than double that amount at 154 minutes per event. This information supports the use of float staff and sitters to decrease the burden of unit staff during dynamic patient events. Unit managers may look to build in a cushion to their staffing formulas to ensure appropriate provider levels at all times.

Limitations of this project include that it is a cross-sectional design covering only twenty-one shifts between two units. This small sampling does not capture the full number of events that can occur over time. The cross-sectional survey of two units limits the generalizability of the results. The data captured cannot be extrapolated into trends or cause-and-effect relationships the way a longitudinal study might. Another limitation is due to the utilization of retrospective RN self-report when gathering data. The data collector spoke with nurses and other staff members at the end of their shift and asked them to recall specific times. The duration of a dynamic patient event could have been over- or under-estimated as a result of difficulty remembering exact times or the desire to skew results.

Chapter VI

Conclusion

With the aid of electronic staffing resources, such as the Cerner Clairvia™ system, we are better able to track patient data and evaluate factors, such as dynamic patient events, that make up nursing workload. The rapid and unanticipated changes in workflow that result from dynamic patient events can alter the projected staffing targets of hospital units. To gain a better idea of the implications of dynamic patient events, further research is necessary. Future studies should include other areas of care within the hospital, not just medical-surgical units, to provide broader, more generalizable results. Longitudinal research can supply information about long-term patterns and examine causal relationships. Only with more research can we gain a clearer picture of the multivariate factors that make up nursing workload. Through in-depth analysis of dynamic patient events, we may examine yet another piece of the staffing puzzle and help ensure optimal nurse-to-patient ratios.

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